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APRIL-JUNE, 2020

BNHS INDIA CONSERVING NATURE SINCE 1883

BOMBAY NATURAL HISTORY SOCIETY

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COVER : **Hoolock Gibbon**
by Dhritiman Mukherjee

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Realigning Priorities!

Just as we desperately need a vaccine for COVID-19, we also urgently need a vaccine to restrain human arrogance and greed! It is this arrogance that makes us believe that we control nature and the environment. We forget that we have little control over nature; in fact, we are always at her mercy. Be it the raging bush fires of Australia, or the wild fires in the USA, or recent forest fires in Uttarakhand, the increase in storm surges and their intensity (we have just witnessed the strongest storm ever recorded in the Bay of Bengal), the recent locust outbreak across Rajasthan, Madhya Pradesh, and Maharashtra, or the unpredictably extended monsoon of 2019, and the latest enraging El Nino that is causing widespread coral bleaching in northern Indian Ocean including reefs of Lakshadweep, Gulf of Kachchh, and Gulf of Mannar, I can cite several more examples of Mother Nature's fury. Nothing is going right in 2020. Humans are the most dispensable entity in nature – can humans survive without nature? The tragedy is that the so-called literate are the least bothered about climate change or about nature, unless it starts pinching them in their comfort zone. On the other hand, those whom we call illiterate are actually more mindful than the 'literates'. They are the accommodative fighting voices for nature, but unfortunately they suffer most from environmental degradation. What an irony!

The last few months saw some extremely controversial projects getting various clearances, such as Dibang-Etalin and Dihang-Patkai. I believe some wilderness areas are beyond economic considerations – only their intrinsic values should be considered. If we do not fight to save such areas, then we as a race have nothing left to fight for. And the greatest irony is that we are trying to establish 'ecological values' on goods through the so-called 'environmental economics'! I have always had a cautious approach towards environmental economics. For me, it is like putting a price tag on an invaluable asset, as if it is a traded commodity. This is the very same economic logic that is used to facilitate clearance of developmental projects by paying a monetary premium. The NPV (net present value), as per prevailing guidelines, of one hectare of forest in Dibang-Etalin, is estimated to be Rs 10.43 lakhs, which in my view is rubbing salt to the wound!

Post COVID-19 (whenever that may be) provides us with an opportunity to look at investments differently. We must think about how we can decongest cities, improve rural organic agriculture, decontaminate soil, air, and water, think of ways to make best use of technologies, to reduce travel and save precious fuel, to reduce our ecological footprint, invest in systematic habitat restoration, improve health and education sectors, and curb wildlife trade. Investing towards a rural, small scale agrarian economy and moving away from an industrial economy is not a bad idea.

The recent study by Trisos *et al.* (2020)[1] suggests that if global warming is kept below 2 °C, less than 2% of assemblages globally are projected to undergo abrupt exposure events of more than 20% of their constituent species; however, the risk accelerates with the magnitude of warming, threatening 15% of assemblages at 4 °C, with similar levels of risk in protected and unprotected areas. The study highlights the impending risk of sudden and severe biodiversity losses from climate change and provides a framework for predicting both when and where these events may occur. It is a very insightful read and I suggest all our young researchers should wade through this excellent paper.

Our current model of development will only increase our conflict with the people and wildlife that are still surviving, occupying the last remaining patches of wilderness. It will also increase the exposure of humans to zoonotic diseases. COVID-19 is certainly not going to be the last zoonotic disease impacting us; this experience shows us that there are super-monsters in the making. We cannot continue to behave recklessly, contaminate the air, soil, water, and food resources, and compromise our immunity with our habits. Imagine what it would be like if the melting of the deep permafrost releases zoonotic diseases of the dinosaur era? How dreadful life may be then for the coming generations. For sure, it is time we put our collective wisdom together and realign our priorities to a changed reality and a changed world!!

Deepak Apte

[1] Trisos, C.H., C. Merow & A.L. Pigot (2020): The projected timing of abrupt ecological disruption from climate change. *Nature* 580: 496–501. https://doi.org/10.1038/s41586-020-2189-9

Nightlife in Mumbai's Forests

Text: **Raju Kasambe**
Camera trap photographs: **Priyadarshini Supekar, Raju Kasambe, and Dilip Giri**
Camera trap photographs of Indian Chevrotain courtesy: **Nikit Surve**

A male Leopard that started visiting the waterhole in the summer of 2019

A peaceful and gentle, but highly alert, herd of Spotted Deer visited the waterhole during the daytime

We were disturbed to read claims in the newspapers that there was no wildlife in Aarey Milk Colony in Mumbai, and that it was an "empty" forest. Aarey is an extension of Sanjay Gandhi National Park (SGNP), a beautiful forest that has existed from ages past situated in the midst of the ever expanding sprawl of metropolitan Mumbai. The Aarey Milk Colony forest patch is contiguous with Film City and the BNHS Nature Reserve, and there are no physical barriers to impede wildlife movements between them. Following the newspaper reports, we felt that there was a need to provide photographic evidence of the wildlife known from this area, and the possibility of adding to the faunal checklist. Accordingly, in January 2017, we started a survey to document the wildlife in the 33-acre forested area of the BNHS Nature Reserve, where our Conservation Education Centre is located.

The surveys revealed the presence of at least 120 species of butterflies and an equal number of bird species in the BNHS reserve. As for mammals, the regularly sighted species in the BNHS reserve were Five-striped Palm Squirrel *Funambulus pennantii*, Spotted Deer or Cheetal *Axis axis*, Barking Deer or Indian Muntjac *Muntiacus muntjak*, Bonnet Macaque *Macaca radiata*, and Rhesus Macaque *Macaca mulatta*, these feeding around the CEC building and some coming to drink at the waterhole that BNHS had created for wildlife. At times, the Southern Plains Grey Langur *Semnopithecus dussumieri* was sighted in the trees, feeding on leaves and fruits. The langurs seldom visited

Bonnet Macaque, endemic to the Indian peninsula, are seen in fair numbers in the CEC land

Barking Deer cautiously approaches the waterhole in singletons

Two Asian Palm Civets occasionally visited the waterhole at night

Indian Spotted Chevrotain (Indian Mouse Deer), is another nocturnal visitor

Small Indian Civet was camera-trapped only in the second year of camera-trapping

Wild Boar tend to be aggressive, pushing and squealing at the waterhole

the waterhole. The occasional alarm calls of the langurs indicated the presence of a large predator, which we never spotted.

With time, we realized that just recording the fauna that we could sight in the forest during the surveys was not enough, as it became apparent that numerous species of wildlife were eluding us both during the day and night. To overcome this, we decided to deploy camera traps to capture the elusive species in the reserve. We started by installing two camera traps at waterholes. Camera traps are now a favoured tool for wildlife experts, as the cameras can capture images and videos of any moving object passing in front of them. This technique is especially helpful in collecting valuable information on shy and elusive nocturnal animals, sometimes revealing the presence of species that one least expects in a region. BNHS had first used this technique in its Jerdon's Courser project with tremendous success, and more recently, in the ongoing eMammal Citizen Science project which has had excellent findings too.

Rhesus Macaque, the macaque of the northern Indian plains

Southern Plains Grey Langur is native to western, central, and south-western India

Our camera traps in the BNHS reserve continue to surprise us with clear and interesting images all through the day and night, some of which are given below.

A sounder of Wild Pig *Sus scrofa* were regular visitors to the waterhole. The video recordings showed the thirsty pigs shoving and pushing one another to get a good drink. Might is right, says the law of the jungle! The Sambar *Rusa unicolor* mostly visited the waterhole in the night, but occasionally came in during the day for a sip. The macaques, Spotted Deer, and Barking Deer were recorded only during the day.

Among the nocturnal visitors, we camera -trapped the shy Asian Palm Civet *Paradoxurus hermaphroditus* and the alert Jungle Cat *Felis chaus* coming for a drink, and a Ruddy Mongoose *Herpestes smithii* emerging from its secret home, the water pipes. In March-April 2019, our camera traps captured the nocturnal Small Indian Civet *Viverricula indica*. On May 17, 2019, Nikit Surve (who is conducting research on leopards in Sanjay Gandhi National Park using camera trapping) camera-trapped an Indian Spotted Chevrotain (or Mouse Deer) *Tragulus* (*Moschiola*) *meminna* just outside the CEC gate, that BNHS

Sambar, which are nocturnal or crepuscular, sometimes visit the waterhole during the daytime

education officers Priyadarshini Supekar and Eesha Shevade had sighted in the evening!

We were aware of the presence of a leopard on the BNHS reserve, and the camera-trap images confirmed this. A shy male Leopard *Panthera pardus* with time seemed to have lost its camera-shyness, and to our anthropomorphizing eyes, it even appeared to be posing at times. What was surprising for us was that six different leopards would visit the waterhole, including a female with a subadult. All the leopards were very alert; they had earlier eluded the BNHS staff who spent hours waiting in a hide just for a glimpse of these evasive carnivores. The leopards would visit the waterhole only after the observers had moved away from the hide – but the cameras work night and day!

The camera traps occasionally revealed leopard movements; stray dogs, an important food for leopards in this area; and even tribal women collecting firewood.

The forests of Mumbai may look 'empty' and devoid of wildlife to the human eye, but when seen through the eye of the camera, the story is different. Many of the 14 species of mammals that our cameras captured are nocturnal, and we hardly ever sighted them otherwise. With their powerful vision, hearing, and sense of smell, they detect human presence and avoid us. The wildlife of SGNP, and BNHS Nature Reserve and Aarey Milk Colony, do not recognize boundaries. For them the forest is one, and they venture into human occupied areas only due to sheer necessity. It is us humans who are constantly pushing the boundaries and encroaching upon their habitats.

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PAINTING: D.M. HENRY

The Enigmatic and Elusive Jerdon's Courser

Text: **Ranjit Manakadan**

Jerdon's Courser *Rhinoptilus bitorquatus* has been both an enigmatic and elusive species for Indian ornithologists. It was first recorded for science by T.C. Jerdon during 1841–1842 in "hilly country above the Eastern Ghats, off Nellore and in Cuddapah" in Andhra Pradesh. Jerdon's notes on the species in his BIRDS OF INDIA (1877) are "found in small parties" and "not very noisy, but occasionally uttering a plaintive cry". An earlier report of the species was published by W.T. Blanford in 1867 in the *Journal of the Asiatic Society of Bengal* (38: 190) mentioning the sighting of birds "18 miles east of Sironcha". Later, writing in Volume IV of the FAUNA OF BRITISH INDIA (1898), he again refers to the sighting of three birds near Sironcha in May 1867, and the sighting of two pairs in March 1871 near Bhadrachalam, of which he managed to shoot a male each. Some of Blanford's comments on the species are "very far from common", "found in thin forest or high scrub", "never in open ground", and "never saw any on hills", which provide some insights into both its rarity and habitat.

L. SHYAMAL / CC BY-SA

The BNHS sound box that reproduces the call of Jerdon's Courser

After these, there was a "presumably authentic" (quoting Sálim Ali in the Oct.–Dec. 1977 issue of *Hornbill*) report in 1900 by Howard Campbell, near Anantapur in the Pennar Valley. Commenting on the same record, E.C. Stuart Baker wrote in THE FAUNA OF BRITISH INDIA: BIRDS, Vol. VI (1929) "Campbell saw it twice, in pairs, running about in dry bush-jungle ... "On both occasions, it ran away with great rapidity and not take to wing" … "Blanford's birds obtained in March and May were not breeding but Howard's male, the only one he managed to get, had very enlarged testes. This was in June, so presumably the birds breed about then." Apart from these three early records, an egg that was lying unnamed in a museum in Scotland – reportedly collected in 1917 from the Kolar Gold Fields area of Karnataka – was identified as of the species in 2014. There is also an unsubstantiated report of a clutch of two eggs collected (location undisclosed) in a newspaper, *The Asian*, in 1895.

Other than these records, the species remained elusive, and was considered among the four 'mystery' Indian birds, along with the Pink-headed Duck *Rhodonessa caryophyllacea*, Himalayan Quail *Ophrysia superciliosa*, and Forest Owlet *Heteroglaux blewitti* (now 'rediscovered'). Efforts were made to look for the Jerdon's Courser during the Vernay Survey of the Eastern Ghats (1929–31) and Hyderabad State (1931–32) surveys, and through two specific surveys by BNHS in 1975 and 1976 in collaboration with the Smithsonian Institution and WWF-India, but these surveys relied more on mist-netting (hoping the birds would fly into the nets) and there were not much focused searches on the species, especially during the first two surveys. The Jerdon's Courser was almost written off from the Indian bird checklist on the assumption that it was extinct after the failure of all the search efforts – till its spectacular rediscovery in 1986 by a (then) young BNHS scientist, Bharat Bhushan from Cuddapah (now Kadapa) district of Andhra Pradesh.

The rediscovery of Jerdon's Courser created a sensation in ornithological circles, and it would be interesting to analyse why Bhushan was successful while the others failed. As he had told me (we were colleagues in the Endangered Species Project), to start with, he meticulously read and scrutinized all the records of the species. He did a lot of reading "between the lines" to pin down the location and habitat in which the birds were collected, as these were not clearly spelt out by Jerdon and others. He also checked the Telugu names attributed to the species, and shortlisted those that were not used for other species and seemed appropriate for this elusive species, which considerably helped

narrow down the search. Its local name in the Kadapa area, as we know now, is *kalivi kodi*. *Kalivi* is the local name for the thorny shrub *Carissa* sp. (in which the species is reported to take refuge during the day) and *kodi* means fowl.

An advantage that Bhushan had was that he spoke Telugu. Conversing in the local language is important for carrying out surveys, especially for elusive species. Bharat distributed posters of the species with write-ups in Telugu to Forest Department personnel, bird trappers and villagers, which helped pass the word around. Knowing Telugu, he could easily communicate with the locals and judge their identification skills by asking them to point out the illustration of the target species among other similar-looking bird species in field guides. It was through such discussions with bird trappers that he started suspecting that Jerdon's Courser was a nocturnal species, which turned out to be true (as is the case with all its congeners in Africa). The earlier birders appear to be not aware (not reflected in their writings) that the species was nocturnal despite its tell-tale large eyes.

On January 14, 1986, Bharat Bhushan's efforts finally paid off, after one of the bird trappers he had been in touch with earlier, managed to catch a Jerdon's Courser near Reddipalli in the Lankamalai Reserve Forest of Kadapa district. After the rediscovery, he obtained a few other sightings in the area, including a photographic record taken during the day. The rediscovery of Jerdon's Courser in the Reddipalli area prompted the Forest Department to declare the area as a wildlife sanctuary, Sri Lankamalleswara Wildlife Sanctuary (464 sq. km). After some time, Bharat shifted to a posting at BNHS headquarters. After he left, in 1988, I almost got an opportunity to work on this enigmatic bird after my stint in Rollapadu Wildlife Sanctuary on the Great Indian Bustard came to a close. However, with change of plans at the very last moment, I was instead posted in Point Calimere Wildlife Sanctuary to work on the waterbirds of the Great Vedaranyam Swamp.

RANJINI MURALI / CC BY-SA

Egg of Jerdon's Courser, collected from the Kolar Gold Fields area of Karnataka in 1917

The next project by BNHS in Sri Lankamalleswara Wildlife Sanctuary was a two-year project (1994–1995) funded by the MoEF (now MoEF&CC, the Ministry of Environment, Forest and Climate Change). V. Elangovan, the researcher, obtained five sightings all in the Reddipalli area. The MoEF project was followed by a major project with funding from Darwin Initiative, which ran from 2000 to 2008. In this innovative project, the researcher, P. Jeganathan, laid out tracking-strips in potential areas to record the species' footprints, which were further confirmed by images captured by camera traps facing these tracking-strips. The call of the species was recorded for the first time, and its playback was used to detect the presence of birds at sites in the study area. However, despite this study, the species remained an enigma, with only a handful of short-duration sightings of birds obtained and with no records of nests, eggs, and chicks. Thus, much remains to be known about the species' population, ecology, habits, behaviour, movements, and breeding biology.

After a short break, the project resumed in 2009 with two researchers Rahul Chavan and Sumant Mali, with additional funding from the Mohammed Bin Zayed Species Conservation Fund and IUCN's Save our Species (SOS)

SUMANT MALI

Camera-trapped fauna in Sri Lankamalleswara Wildlife Sanctuary: Chinkara, Jungle Cat, Grey Junglefowl, and Golden Jackal

Fund. However, they managed to sight only two birds in one instance during the entire tenure of the study till 2012. After this project, in 2013, I was asked to oversee a newly sanctioned two-year, MoEF project on the species in Sri Lankamalleswara Wildlife Sanctuary. However, this too 'fizzled out' for me at the last moment. The researcher of this two-year project, Sumant Mali, used around 200 cameras in an attempt to record the species. However, other than obtaining photographs of many species of interesting birds and mammals through the camera traps, there was not a single photograph of the Jerdon's Courser.

In the past decade or so, there have been significant changes in the landscape of the Jerdon's Courser habitat, including the construction of the Telugu Ganga Canal (that supplies water from Nagarjuna Sagar Reservoir to Chennai), changes in the vegetation (including increase in shrub cover), and expansion of agriculture. Poaching of wildlife, including birds, is not uncommon as reported in Sumant Mali's study. Has Jerdon's Courser gone extinct from the area with all these changes and threats? Or has it moved to other more suitable and less disturbed adjoining areas – there are still tracts of scrub country in the plains along the hills of the Eastern Ghats in this region that look suitable Jerdon's Courser habitat. This is not to say that there are no pressures here – vast tracts of scrub habitat south of Kadapa have disappeared with government establishments, engineering and medical colleges, hospitals, and industries gobbling up land. And one can expect more of these wilderness areas to be lost in the coming decades in the name of development.

Over the years, I have been troubled by a nagging query whenever the topic of the Jerdon's Courser arose. What would have been

SUMANT MALI

Typical open scrub habitat of Jerdon's Courser

the 'story' if I had indeed shifted to Reddipalli in 1988 to work on the species? Would I have been able to locate nests, eggs, and chicks that eluded the others, and also managed to add significant insights into this enigmatic species – I tend to be 'lucky' in the field, my colleagues say! And similar questions arise about the second missed opportunity in 2013. I still occasionally ponder on undertaking a project on the Jerdon's Courser, even though age is not on my side now. Will I be lucky with a third (and final) try, or will the opportunity to work on this enigmatic and elusive species again elude me? Only time will tell, as the saying goes!

Ranjit Manakadan is Deputy Director (Ornithology) in BNHS and has been working with the Society for almost four decades.

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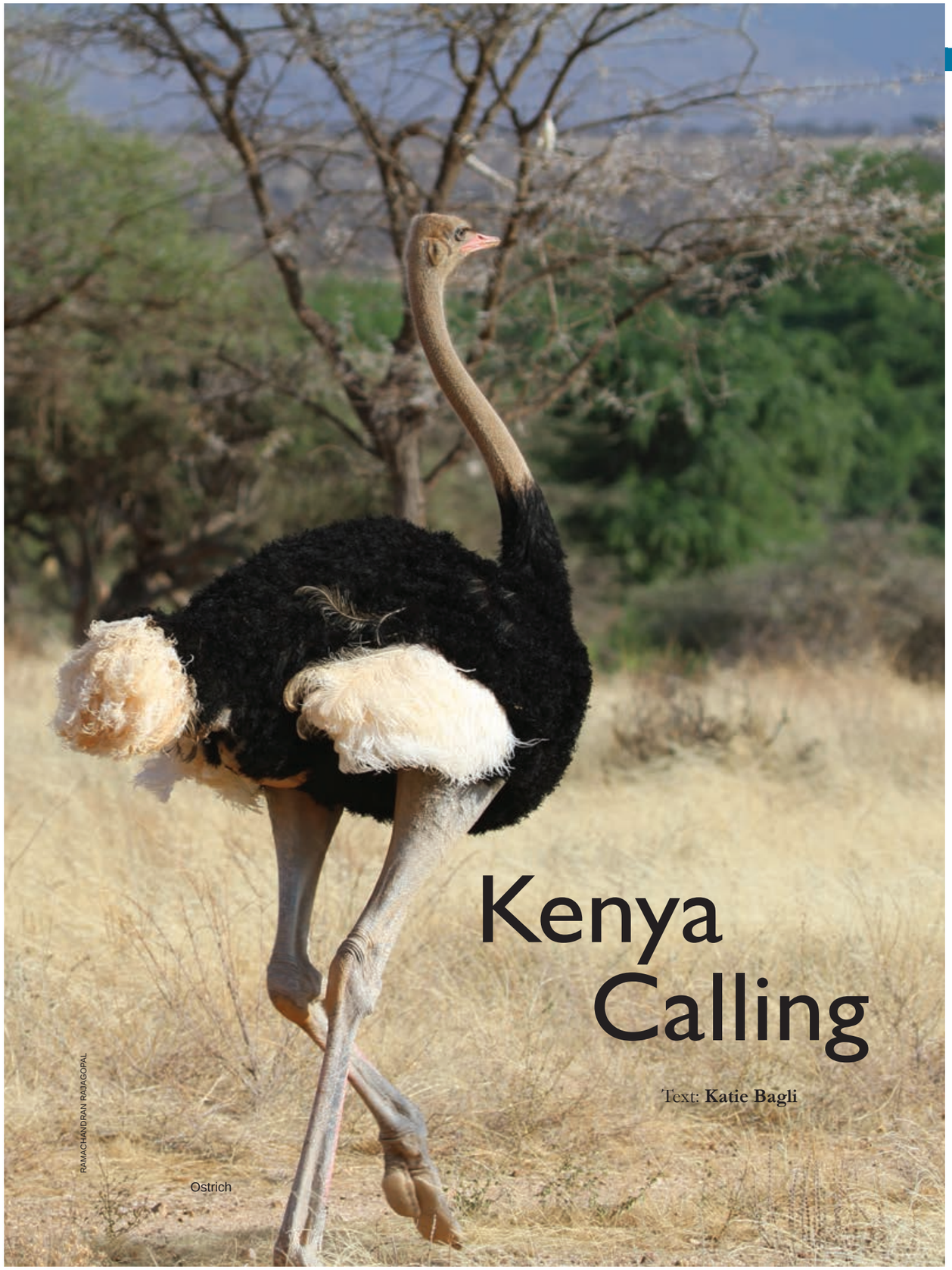


RAMACHANDRAN RAJAGOPAL

Ostrich

Kenya Calling

Text: **Katie Bagli**

RAMACHANDRAN RAJAGOPAL

Crowned Hornbills wait to nab a swift fledgling from its mud nest

Having more than a soft corner for wildlife, I enrolled for a BNHS trip to Kenya, but I had not in my wildest dreams anticipated that I would witness such diversity and plethora of fauna. Even as we, a group of 16 like-minded nature lovers and our leader Asif Khan, stepped on to African soil, we were greeted with the cawing of crows with white fronts. That was my first surprise, Pied Crow – the tuxedoed feathered bipeds of Africa. I was not aware that such crows existed!

After landing at Jomo Kenyatta International Airport, Nairobi, we headed straight for Aberdare National Park, a protected area in the Aberdare Mountain Range in central Kenya. The drive, though rather long, was over smooth, unpotholed roads bordered with African Tulip Trees, Cactus trees, and Umbrella Acacias. The acacias seemed as though they were decorated for Christmas, festooned with lantern-like weaver bird nests dangling from them. The Aberdare Country Club Resort simply took our breath away. Impalas with the typical black McDonald style 'M' marking on their butts, and Dik-dik antelopes that looked like toys, pranced around to the chorus of birds. Here we were thrilled to see our first hornbill species – the Crowned Hornbill – they were after the fledglings of swifts in their mud nests within the roof of the resort. We didn't know then that Kenya had so many other species of hornbills in store for us – Red-billed, Yellow-billed, Grey, and the amazing Southern Ground Hornbill with its black garb, beady eyes, and patches of bare red skin on the face and throat, the latter being inflatable.

Talking of birds, we came across some of the most spectacularly coloured ones in all of Kenya, as if nature had been trying out various combinations of paints on her palette. Just to name a few: the Cut-throat Finch with a blood-red band across its throat, Grey-headed Kingfisher with black and turquoise blue wings and tail and a russet underbelly, Chestnut Sparrow with its resplendent shades of sepia plumage, and the enormous Ostrich with its small head, long neck, and velvet black tutu of feathers, moving in the grass with the grace of a ballerina. Then the very handsome Bateleur Eagle with its crimson beak, flying about among the Yellow Fever Acacias, the sunny yellow Baglafecht Weaver, Red-cheeked Cordon-bleu that seemed to have put on too much rouge, and the species that brought us to our knees in

RAMACHANDRAN RAJAGOPAL

Red-cheeked Cordon-bleu looking as though it has put on too much rouge

SHAHROKH BAGLI

Chestnut-bellied Sandgrouse – are its chicks hiding in its underbelly feathers?

RAMACHANDRAN RAJAGOPAL

Black-capped Weaver contemplating on where next to build a nest

RAMACHANDRAN RAJAGOPAL

Superb Starling showing off its resplendent attire of colourful plumage

admiration – Superb Starlings with their coat of iridescent blue-green feathers contrasting with orange-red on the belly.

The diversity of mammals was mind-boggling too. Tall giraffes, walking with their 'heads in the clouds' – Samburu National Reserve had the reticulated variety with its geometrical skin patterns, while in Masai Mara we saw the Masai Giraffe whose skin appears to have paintbrush strokes, and the Rothschild's Giraffe that appeared to be wearing white socks. Strangely enough, the long necks of all giraffes have only seven cervical vertebrae, just like all other mammals. Imagine the length of each vertebra!

Then there was a mother elephant and her calf, using the sensitive tips of their trunks to pull out bushels of grass and popping them into their mouths contentedly, till the calf happened to pull out some kind of green fruit along with the grass. The mother grabbed it out of the calf's mouth and tossed it away! Perhaps her instinct told her that it was poisonous. All this was done in silence but I suspect she was scolding her young one for being careless, through infrasonic rumblings – a differently pitched voice used by elephants that is inaudible to us.

It was incomprehensible to us how the zebras and wildebeest communicated with each

other. In Masai Mara, we saw what seemed like thousands of them gathered together, covering the entire horizon. And then to our delight, there was the slow migration, like a great exodus, apparently in search of greener pastures, along part of their loop migration to Serengeti in Tanzania. It would be around March when they would return to Masai Mara. The zebras always lead as they have a good memory and remember the route. Also, they are clever enough to avoid danger. The wildebeest just follow each other blindly – exhibiting typical herd mentality – and sometimes they fall prey to crocodiles in the river, and lions, cheetahs, and leopards on land.

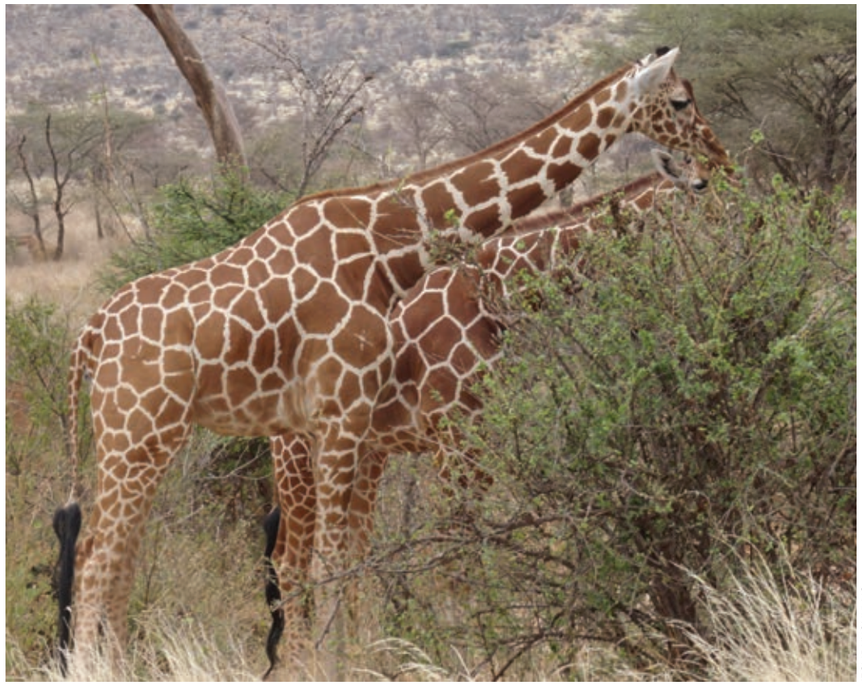
The hippopotami that we came across in the Mara River were expressing their *joie de vivre*. Their twinkling eyes and wiggling ears above the water surface would suddenly give way to monstrous forms as they emerged, splashing and ducking with loud snorts. It was difficult to believe that these carefree creatures can be one of the most dangerous animals on the planet. The highlight of the show was when a hippo climbed on to the bank, vigorously swinging its tail, and with voluminous grunts sent forth an unexpected shower of poop.

In Samburu National Reserve, we came across a female cheetah with four cubs all relishing her kill, a Thomson's Gazelle. Having fed to their hearts' content, they lay down in the shade of an acacia tree. But a little while later, on seeing vultures scouring the skies, they became alert and went back to the kill to stuff themselves before the scavenger birds could get their turn. The vultures – Lappet-faced, White-backed, and Ruppell's Griffon Vulture – along with three Tawny Eagles and a Steppe Eagle, seemed to be waging war. Fanning out their enormous wings, jostling and scrambling, calling out to each other aggressively, they finished every bit of the kill in no time, leaving behind only the horns and bones for perhaps the hyenas. After all, nature provides for all creatures, nothing is wasted.

On another occasion, we got to see a similar drama of vultures scavenging upon the carcass of a wildebeest. But this time there were three Marabou Storks standing tall and unperturbed,

SHAHROKH BAGLI

Hippopotami wallowing in the Mara river



SHAHROKH BAGLI

Reticulate Giraffe are typical inhabitants of Samburu National Park

in a dignified gentlemanly manner by the side of the rowdy crowd of vultures and eagles. After quite some time, they decided it was their turn. The unmannerly birds had eaten enough. So, using their big pointed bills to push the vultures aside, and inflating the yellow gulars dangling from their throats, they began voicing their rights to the kill. When some of the vultures didn't heed, the Marabous asserted themselves by pulling the wildebeest's entrails right out of their beaks! Indeed, the Marabous taught us a lesson in patience and perseverance.

RAMACHANDRAN RAJAGOPAL

Spotted Hyena after a belly-filling meal

During one of the safaris, our van nearly ran over a pair of Chestnut-bellied Sandgrouse and their two chicks, so well camouflaged were they with their cryptic sandy plumage and markings. But what took us by surprise was that under our very eyes, while we were photographing them, the chicks just disappeared. The parents had probably taken them into their fold, hiding them under their belly.

Lake Nakuru was a beautiful sight, surrounded by grassland and scrub, with an abundance of aquatic birds – ibises, egrets, cormorants, darters, and of course, the Lesser Flamingos. But the number of flamingos was far less than expected, probably because the water is losing its alkalinity, getting diluted by the treated water from a nearby town, we were told. But while boating in another smaller lake –

RAMACHANDRAN RAJAGOPAL

Marabou Storks waiting politely for their turn to scavenge

RAMACHANDRAN RAJAGOPAL

Grey-headed Kingfisher on the ready to dive below for fish

Naivasha – we got to see some very interesting species: the Black Giant Kingfisher, Sacred Ibis (which was worshipped by the ancient Egyptians), pelicans, and Egyptian Geese.

It was thrilling to get the jungle feeling and to be among the wild in all the resorts where we were put up. This is thanks to the well-planned animal-friendly ecotourism of Africa, whether it was in Aberdare where we got to hear loud croaking of toads while Impalas watched us from behind trees, or in Samburu where we had to keep our cottage doors closed as families of baboons decided to camp just outside. Early in the morning, outside these same cottages, we were greeted by dik-diks and 40 to 50 guineafowl. Hornbills and weavers birds would even come begging to our tables while we breakfasted (but of course, we did not encourage them as it was not their natural food). An unexpected visitor came one night, climbing up the wire net on the window of our room – it was a civet cat! In Nakuru, the kingly breakfast we were served did not tempt us enough to keep us glued to our chairs, as there were so many never-seen birds flying in and out of the dining hall, some of them boldly eating right out of the plates as soon as our backs were turned.

As for Masai Mara, we got goose bumps listening to the hyenas moaning by night, and felt we were in wonderland when watching Bushbuck and Waterbuck antelopes freely moving around the resort by day. One of the best feelings was when all 16 of us got off our vans in the middle of the Masai Mara savannah and sat in the grass under the shade of an acacia, to have our packed lunch. It thrilled all of us to be in the very lap of nature, with starlings and weaver birds fluttering around us. The weak-hearted among us were thankful that no other large animal came along to have us for lunch!

The eight days we spent in Kenya convinced all of us how invaluable grasslands can be as habitats for innumerable creatures. Sadly, grasslands have been considered as wastelands in our own country and have been put to other uses, making their own rightful inhabitants homeless and driving them to extinction. Our trip also made us appreciate the abundance and diversity of life on our planet. Truly, nature's bounty seems to be infinite.

Katie Bagli is a children's writer who prefers to write about Nature. She also conducts innumerable workshops on wildlife and creative writing.

Indian Moon Moth *Actias selene*

DHRITIMAN MUKHERJEE

Editors' Choice

A Walk in the Wild

A spell is cast, a drama unveiled,
enter their arena and you feel the mystique,
a lot to offer, both majestic and mild,
they will enchant you with their style!

Competing around, feathery ones excitedly greet,
as you watch them hide and seek, they fondly tweet.
Ungulates express their surprise as you move by,
munching and munching and
only munching in the areas nearby.

Langurs jump about and wish you joy,
scratching and playing they look down and enjoy.
Unseen eyes watch and keep guard,
shy and sly, the leopards avoid the main trail,
such that a sighting of theirs makes you applaud.

Bison and elephants and buffaloes you may meet,
ponds and lakes and streams with birds wetting their feet,
crocodiles may give you a glance oblique,
vultures and raptors and owls may intimidate!

Trees tall and short, stout and lean,
supporting winding creepers umpteen,
a breeze carries their whispers aloud,
as day rises, a keen sun peeks from the cloud.
A hale and healthy forest welcomes all as one,
they say nature differentiates between none.

Then a spectacle unfolds,
trees stand their ground in quiet,
all other inmates are rooted to their site,
and the path shudders with fright,
as the sun shines a glaring spot light,
his skin glistens, a golden bright,
he walks the road with majesty and might!

You stay fixed as if bound, you dare not make a sound,
till the King judges and permits your pass,
for it is his to decide whether to let you last!

If accepted, you may travel forth,
rocky and winding; straight and steep;
such is the trail as you venture deep.
You will definitely relish the sojourn,
and take back wild memories as you move on!

As you trace the route back and bid goodbye,
there is a request they want to make –
a promise is what they need,
an enduring support is what they plead,
hoping that someday, some of you will heed,
and their Call from the Wild will grow to
a Call for the Wild!

Journey through their beautiful world,
For you are sure to love this walk in the wild!

– Shalini Gopalakrishnan

ABOUT THE POSTER

The Indian Moon Moth *Actias selene* (also known as Indian Luna Moth) is one of the largest moths of the genus *Actias*. It has a wingspan of 130–166 mm. First described by Jacob Hübner in 1807, this moth belongs to family Saturniidae, which includes the largest moths in the world. It is widely distributed in the Indian subcontinent and Southeast Asia, further north to Russia and eastwards to Japan. Moon moths are so named because the eyespots in the forewing and hind wing look like moons. These eyespots vary in the different species of this genus.

Among the prettiest of moths, the Indian Moon Moth is nocturnal or crepuscular, and is often attracted to light. The species is sexually dimorphic – the female is larger than the male, has a larger wing surface area, thin antennae, generally rounded wingtips, and a heavier body. The male is smaller, but with much brighter colours, more falcate wing tips, larger antennae, and a pair of claspers at the terminal end of the abdomen that serve to hold the female while mating. The female attracts the male moths through pheromones, which are chemical substances secreted for this purpose. Males are known to detect the pheromones from as far as 11 km!

A sericigenous moth (i.e. a silk producing moth), a single cocoon of this species is known to produce a continuous unbroken fibre of 300 to 350 m. It is popular among amateur entomologists for its beauty, and among hobbyists who like to rear it from eggs that are available from commercial sources. The adult moth has rudimentary, non-functional mouth parts and no digestive tract, as this phase is devoted almost entirely to reproduction.

Our fast vanishing forests are a cause of concern for the survival of wild silk moths, including this gorgeous denizen of the dusky nocturnal world. ■

DHRITIMAN MUKHERJEE

Indian Moon Moth *Actias selene*

Otter Attack!

Otters have been known for their curious and playful behaviour and researchers have always taken a keen interest in their intelligence and strong family bonds. Their family bonding make them aggressive and they are known to take on even large crocodiles to protect the pack when threatened.

Otters are not known to be a threat to humans in general, but there are some extremely rare reports of attacks on humans. The Giant River Otter of South America, with males growing as large as large as 2.1 m, is very protective of its young and the pack will attack intruding boats. In Florida (USA), there are reports of the North American River Otter attacking kayakers and children playing in the river causing severe injuries.

In India, we recently learnt of an attack by a Smooth Coated Otter family in Rawatbhata, a small town in Chittorgarh district of Rajasthan. Rawatbhata

is situated on the banks of River Chambal, which flows through the rocky mountains of the region. The river flows between Bhainsroadgarh Sanctuary and Rawatbhata. This terrain provides excellent habitat for Smooth Coated Otter. On the outskirts of Rawatbhata is a small lake adjoining River Chambal and a small fishermen community depends on this lake for their livelihood.

It was the morning of January 20, 2019, Pappulal a contract labourer went to the lake for bathing. There were no otters around when he arrived at the lake. He was unaccompanied and there was no soul in his visibility range. He said that he was sitting when the otter family attacked him from the rear. Taken by surprise, he lost his balance and fell into the lake and soon the pack of around seven otters was all over him. The attack lasted for around five to seven minutes; he was badly bitten on his thighs and feet. He was not faking the number of otters attacking him as we had regularly observed about eight otters in this area. People nearby heard his cries and rushed to the site. The otters returned to the river at this point. The man was severely injured and was rushed to a hospital. The locals blamed the otters for a similar incident last winter, though there was no witness. A local fisherman, who went for fishing late evening, was found dead in the lake the next morning. We found a report in *The Hindu* of a similar attack in Kerala and a report published by Suresh K. Govind and E.A. Jayson from wildlife department Kerala, in which one fatal and two-non fatal incidents were recorded in Thrissur district of Kerala in 2010 and 2011.

We work for the conservation of otters in our region and spread awareness of their importance in riverine systems. This incident has had an adverse impact on our advocacy. An attack can result from an adult's instinct to protect the pups. But in this case this could not be the reason, as the bevy had adults and sub adults. Our intent is to inform people and hope that observations on otter behaviour can aid our awareness programme.

Rimal Sudhindran, Charchit Jain &
Anirudh Singh Chauhan
Rawatbhata

Biodiversity Hotspeck vs a Hydropower Plant

Text: **Girish Jathar, Monsoon Jyoti Gogoi, Biswajit Chakdar, Harshal Bhosale, Mandar Sawant, and Rohan Bhagat**

In 2009, the Arunachal Pradesh government decided to develop a 3,097 MW multi-purpose hydro-electric project, one of the biggest power projects in the country. However, its approval triggered opposition due to possible environmental impacts and the forced relocation of the locals. If you had a choice between conserving biodiversity and uninterrupted power supply, what would you choose?

ROHAN BHAGAT

River Landscape, Arunachal Pradesh

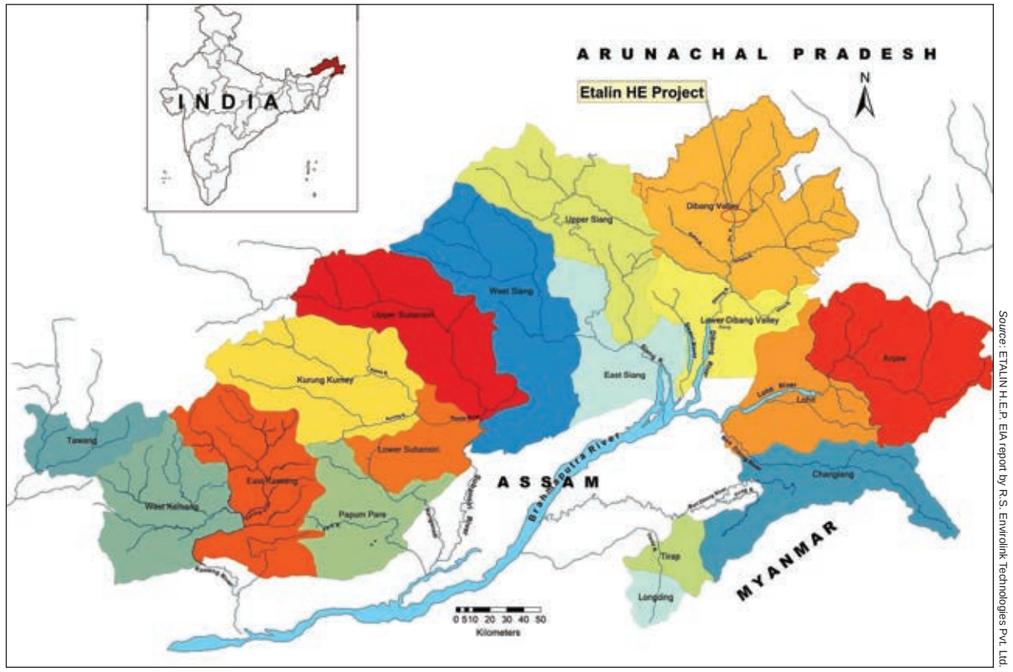
Mishmi Hills and biodiversity

Mishmi Hills, a biodiversity hotspeck (a subset within a biodiversity hotspot), is part of the Himalayan biodiversity hotspot, which is one of the three mega biodiversity hotspots in the Indian region. The rugged landscape of Mishmi Hills ranges from 200 m at the foothills to 5,500 m up to the snowline. This complex hill region with varying elevations receives heavy rainfall, which can be as much as 4,500–5,000 mm annually in the foothills.

The topographical diversity and climatic conditions of the area have favoured the growth of luxuriant vegetation, ranging from grasslands, bamboo forest, evergreen forest and others, to temperate conifers and alpine meadows, which are home to myriad biodiversity. The area supports about 6,000 plant species (including 500 orchids and 50 rhododendrons), 100 mammals, and 680 birds, besides a large number of butterflies and other insects. This unique assemblage of life forms can be attributed to its geographical location, which is at the trijunction of the Palaearctic, Indo-Chinese, and Indo-Malayan biogeographic zones. The only human footprints in this region are small hamlets and patches of subsistence agriculture at the edges of the forest, and paddy fields in the foothills.

This region is important especially for globally threatened and near threatened species. Six globally threatened mammal species are found here, of which three are Endangered and three Vulnerable (Table 1). The region harbours about 56% of the total number of bird species of India. Among them, 19 are Threatened (4 Critically Endangered, 2 Endangered, 12 Vulnerable and 10 are Near Threatened species (Table 2). The region also has three very rare, range-restricted, endemic bird species.

Dibang Valley is a butterfly haven, with more than 500 species recorded. Many species and subspecies of butterflies occurring in southeast Tibet and Yunnan are also seen in Dibang Valley, e.g., the Chocolate Tiger *Danaus melaneus* that is distributed in southeast Tibet, Yunnan, and Dibang Valley. The Brahmaputra river basin serves as a barrier to the dispersal of many butterfly species, resulting in high rates of endemism and speciation in Dibang Valley. For example, the



Source: ETALIN H.E.P. EIA report by R.S. Envirolink Technologies Pvt. Ltd.

Proposed project site in Dibang Valley

Table 1: Globally Threatened and Near Threatened mammal species in Dibang Valley

Species	Global Status
Hoolock Gibbon *Bunopithecus hoolock*	Endangered
Red Panda *Ailurus fulgens*	Endangered
Bengal Tiger *Panthera tigris*	Endangered
Leopard *Panthera pardus*	Vulnerable
Mishmi Takin *Budorcas taxicolor*	Vulnerable
Chinese Goral *Naemorhedus griseus*	Vulnerable
Himalayan Serow *Capricornis thar*	Near Threatened

Table 2: Globally Threatened and Near Threatened bird species in Dibang Valley

Species	Global Status
Bengal Florican *Houbaropsis bengalensis*	Critically Endangered
White-rumped Vulture *Gyps bengalensis*	Critically Endangered
Slender-billed Vulture *Gyps tenuirostris*	Critically Endangered
Red-headed Vulture *Sarcogyps calvus*	Critically Endangered
Greater Adjutant *Leptoptilos dubius*	Endangered
Black-bellied Tern *Sterna acuticauda*	Endangered
Swamp Francolin *Francolinus gularis*	Vulnerable
Chestnut-breasted Partridge *Arborophila mandellii*	Vulnerable
Blyth's Tragopan *Tragopan blythii*	Vulnerable
Sclater's Monal *Lophophorus sclateri*	Vulnerable
Rufous-necked Hornbill *Aceros nipalensis*	Vulnerable
Pale-capped Pigeon *Columba punicea*	Vulnerable
Lesser Adjutant *Leptoptilos javanicus*	Vulnerable
Rusty-bellied Shortwing *Brachypteryx hyperythra*	Vulnerable
Beautiful Nuthatch *Sitta formosa*	Vulnerable
Marsh Babbler *Pellorneum palustre*	Vulnerable
Jerdon's Babbler *Chrysomma altirostre*	Vulnerable
Black-breasted Parrotbill *Paradoxornis flavirostris*	Vulnerable
White-cheeked Partridge *Arborophila atrogularis*	Near Threatened
Yellow-rumped Honeyguide *Indicator xanthonotus*	Near Threatened
Great Hornbill *Buceros bicornis*	Near Threatened
Ward's Trogon *Harpactes wardi*	Near Threatened
Blyth's Kingfisher *Alcedo hercules*	Near Threatened
White-tailed Eagle *Haliaeetus albicilla*	Near Threatened
Black-necked Stork *Ephippiorhynchus asiaticus*	Near Threatened
Great Thick-knee *Esacus recurvirostris*	Near Threatened
River Lapwing *Vanellus duvaucelii*	Near Threatened
Red-breasted Parakeet *Psittacula alexandri*	Near Threatened

Dibang Valley endemic Roy's Argus *Callerebia dibangensis* was described only in 2013, while many hairstreaks, rings, and skippers, among others found in the region, are yet to be described. Species like White-bordered Argus *Callerebia baileyi* is restricted to Mishmi Hills and south-east Tibet. This rich diversity of butterflies and their unique colourful patterns (like the Northern Jungle Queen *Stichophthalma camadeva*) have found a place in Mishmi lives, folklore, and in the traditional weaves

Himalayan Serow (1), Hoolock Gibbon (2), Red Panda (3), and Malayan Giant Squirrel (4) are some of the globally threatened mammal inhabitants of Dibang Valley

of the region, including their war attire. Some other range-restricted butterflies of Dibang Valley are the False Tibetan Cupid *Tongeia pseudozuthus*, Chinese Silverline *Spindasis zhengweilie*, Khaki Silverline *S. rukmini*, Evans' Silverline *S. evansii*, Tiger-mimic Admiral *Limenitis rileyi*, Mottled Argus *Callerebia narasingha*, Tibetan Brimstone *Gonepteryx amintha thibetana*, Grey Commodore *Bhagadatta austenia purpurascens*, and Abor Freak *Calinaga aborica*.

India's energy needs and hydropower

India ranks third among the largest producers and consumers of electricity in the world. In November 2019, India's installed power generation capacity reached 364.9 gigawatts (*The Economic Times* 2019), which is sufficient to meet the country's present electricity demand. Despite this, we hear of plans to build new plants to generate electricity. Why so? The reason is that though there

is enough electricity for the country, there are problems in the distribution systems, which lead to power cuts and connectivity issues for consumers, placing further demands on energy. Moreover, the aggregate electricity demand of India is likely to go up to 2,785 TWh (6.2% more than at present) by 2030 (Ali 2018). To meet this demand, India must generate more electricity through both renewable and non-renewable sources.

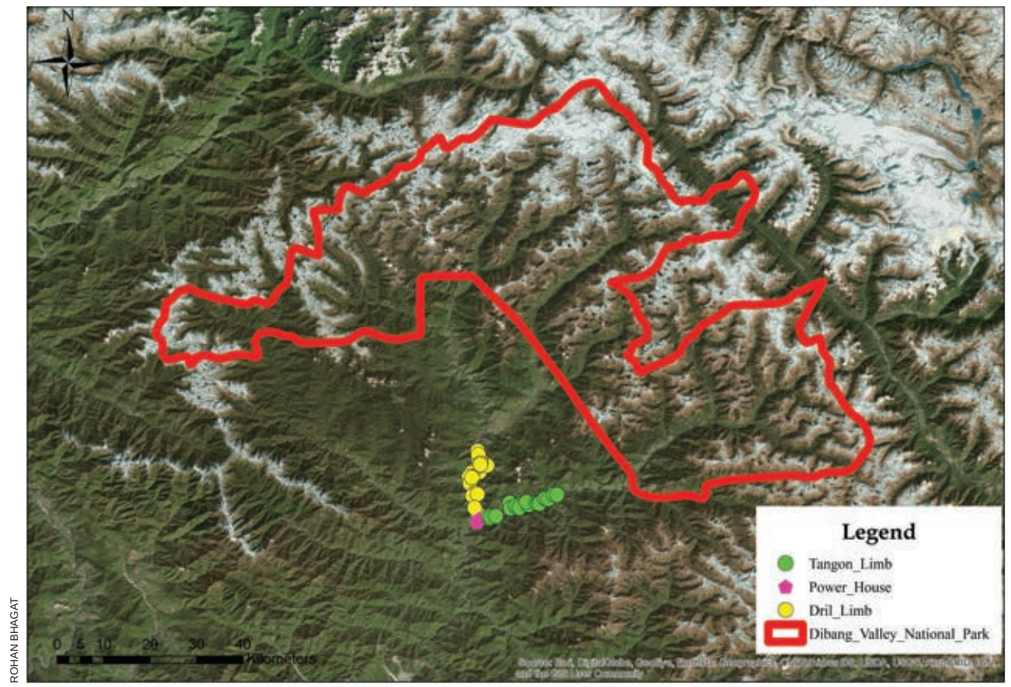
Of all the available sources of power generation, hydropower is considered to be the most efficient and cheap, and it is also renewable energy. Owing to its geography, India has several rivers, and these are perceived to have massive potential for harnessing hydropower. Thus, hydropower contributes about 12.4% of the total energy generation in India (Power Ministry 2020).

The Government of India has announced many policy initiatives for sustainable hydropower development in the Himalaya and the hills states of the Northeast. However, the Himalaya and especially the Northeast states are among the most seismically active regions of the world. Massive earth moving, road construction, and industrial drilling projects could only worsen the frequency and magnitude of geological disasters and natural calamities. However, the energy requirements of the country are being considered as high priority, far greater than the risks of natural calamities!

Etalin Hydroelectric Project

The 3097 MW Etalin Hydroelectric Project (HEP) is a storage-based hydroelectric project, which proposes the construction of two dams: a 101.5 m high dam on the Dri river near Yuron village, and an 80 m high dam on Tangon river, both of which are tributaries of Dibang river. An underground powerhouse is proposed, with 10 units of 307 MW each.

The area proposed for the Etalin HEP lies within Dibang Biosphere Reserve, in the Lower and Upper Dibang Valley districts of Arunachal Pradesh, which are part of the Mishmi Hills. The altitude ranges from 400 m to 5,000 m above msl. Ashupani, Deopani, Jowe, Enjopani, and Diphu are the main perennial streams flowing through the reserve into the Dibang river, which is one of the main tributaries of Brahmaputra. The



ROHAN BHAGAT

Proximity of the project site to Dibang Wildlife Sanctuary

proposed project site is merely 14 km from one of the most uninhabited protected areas of India, the Dibang Wildlife Sanctuary, which itself is part of one of the most contiguous wilderness areas of India, which can only be compared with Namdapha National Park in Arunachal Pradesh. Many animals mentioned in Tables 1 and 2 are likely to be present in the vicinity of the proposed project area. Any developmental activity would jeopardize the existence of many threatened and near threatened species.

Owing to the fragile ecosystem of the project site, the project proponents carried out the mandatory Environmental Impact Assessment of the project. The first assessment was carried out by R.S. Envirolink Technologies Pvt. Ltd. Further to this, on 23rd June, 2017, the Forest Advisory Committee of the Ministry of Environment, Forest and Climate Change (MoEF&CC) recommended that the Wildlife Institute of India should conduct a year-long study to prepare a wildlife conservation plan for the impact zone of Etalin HEP. Both these studies have several flaws as discussed below.

R.S. Envirolink Technologies Pvt. Ltd (2015)

The report submitted clearly lacks scientific merit, as it has several technical and scientific flaws. The report states, "Sampling was carried out on fixed width trails of 2 km wherever the terrain permitted, and point counts were carried out at fixed distances at random intervals. As the normal usual systematic transects for mammals and birds were not possible in this study area, due to difficult terrain, therefore mostly trails were used for faunal sampling." This indicates biased sampling of the flora and fauna, and will result in overlooking of important, and possibly some undescribed species of this region, Below, we address some important aspects of the various taxa that were overlooked in the report.

Avifauna: The section on birds is flawed in terms of methodology and the results derived from it. There are flaws in sampling, seasonality in sampling, analysis of the data, and interpretation. The report indicates the presence of only 33 bird species from the survey area, which is a gross underestimation of the avifaunal diversity of this rich region. In fact, the Dibang Valley boasts of the presence of 680 bird species, almost 50% of the total bird species of India. A birder can easily record 33 bird species within half an hour in any part of the Mishmi Hills. Thus, sighting of only 33 species in a span of one year, covering three seasons, raises questions on the findings of the study. Surprisingly, the report does not mention the presence of threatened bird species, whereas at least five Threatened and four Near Threatened species are known to occur in this area. The report mentions that felling of large trees would have an adverse impact on birds and other fauna, which depend on the forest. However, it fails to indicate the importance of this habitat to the Threatened and Near Threatened bird species.

The report completely ignores mention of the adverse impact of construction activity on the floodplains of Dibang River. The downstream floodplain is an excellent grassland, which harbours at least 11 globally threatened species (four Critically Endangered, two Endangered, five Vulnerable), and three Near Threatened species. The most notable impact will be on the habitat of Bengal Florican, from where at least 20 individuals had been estimated. Other threatened species such as Swamp Francolin, Marsh Babbler, Jerdon's Babbler, and Black-breasted Parrotbill are also reported. This makes the downstream grasslands critical in terms of the conservation of threatened bird species. Changes in the grassland composition due to alteration of hydrology, landslides due to deforestation, and dumping of debris directly into the rivers would impact the downstream soil quality and lead to degradation of grassland habitats.

Entomofauna: The report records only 18 insect species (excluding butterflies) from the study area, which includes dragonflies, cicadas, bugs, bees and wasps, ants, flies, beetles, which is a gross under-representation of the true entomological diversity of the HEP site. Approximately 80 percent of the world's species are insects, and it is strange that only 18 species of insects were reported from a rich, biodiverse region like Dibang Valley! This reflects adversely on the quality of the EIA report.

All the insect groups mentioned above show significant diversity in Dibang Valley. Beetles (Coleoptera) which are among the most diverse insect groups, known to constitute 25% of all known animal life-forms, were not covered adequately in the study. Also, insects other than

butterflies are reported only up to class (bug and beetle) level!

The only well-studied group of entomofauna in this report is butterflies, with representation of 45 species, but even this is considerably low for Lepidoptera. A single-day species count during summer (the most favourable season) in Etalin area could easily yield 100–150 species of butterflies; in fact, the Etalin area could have more than 300 species of butterflies owing to the vegetation diversity. The life cycle of butterflies and their dependency on host plants is totally ignored in the project. The report further fails to provide information on moth species, despite this group being mentioned in the report. The report also fails to provide details of methodology.

The following errors were found in the butterfly checklist (Table 7.30):

Species no. 10: Common Grass Dart *Taractrocera maevius* does not occur at the elevation of Etalin.

Species no. 25: Eastern Blue Sapphire *Heliophorus oda* does not occur in Northeast India.

Species no. 33: Small Copper *Lycaena phlaea* does not occur in Northeast India.

Species no. 46: Dark Pierrot *Tarucus ananda* is not likely to occur in the elevation zone of Etalin.

Species no. 74: Dwarf Crow *Euploea tulliolus* does not occur in Northeast India.

Species no. 103: Dark Glassy Tiger *Parantica agleoides* does not occur in Northeast India.

De Niceville's Windmill *Byasa polla* (1), Single Silverstripe *Lethe ramadeva* (2) and Bhutan Blackvein *Aporia harrietae bailey* (3) are legally protected in India under Schedule I of the Wildlife (Protection) Act, 1972. Roy's Argus *Callerebia dibangensis* (4) is endemic to Dibang valley, the Tibetan Brimstone *Gonepteryx amintha thibetana* (5) is restricted to Arunachal Pradesh and SE Tibet

The EIA survey for amphibians was not conducted in monsoon, their peak activity period. In this collage: Gliding Frog (1), Post metamorphic tadpole of a gliding frog species (2), Himalayan Tree Frog (3), and Horned Frog (4)

Species no. 119: Common Three-ring *Ypthima asterope* does not occur in Northeast India.

Species no. 162: Redspot Jezebel *Delias descombesi* does not occur in the elevation zone of Etalin.

Species no. 163: Painted Jezebel *Delias hyparete* does not occur in the elevation zone of Etalin.

In conclusion, the report completely ignores the entomofauna, mentioning only 18 species of insects, other than the 179 species of butterflies recorded at the HEP site.

Herpetofauna: A study by Roy *et al.* (2018) reported 38 species of amphibians from Dibang Valley. This includes 11 unidentified species of frogs, which indicate that these species are rare and potentially new to science. However, the EIA report mentions the occurrence of only five species of amphibians, which is an under-representation for this biologically rich area. The EIA report also enumerates 11 species of reptiles from the HEP area. There are several discrepancies regarding scientific names, classification at family level, and identification of species. The methodology followed to survey the herpetofauna is the same as that for mammals, which indicates a naïve approach to the study of herpetofauna.

Flora: The EIA report lists 372 species of angiosperms, 7 species of gymnosperms, 29 species of pteridophytes, 11 species of bryophytes, 14 species of lichens, 6 species of fungi, and 10 species of algae. Though the listing looks impressive, there are numerous errors in the species list, such as spelling mistakes, repetition of species, inaccurate records, and incorrect scientific names. There are some glaring errors, such as occurrence of a desert species, *Ephedra aspera*, which is very unlikely to occur in the area. This creates doubts on the credibility of the list.

Wildlife Institute of India (2018–2019)

Avifauna: The report laid emphasis on the ecological role of birds as indicators and the ecosystem services they provide. The report is compliant with the methodologies used to study birds, listing 230 species. However, it fails to provide details on the replicates used to confirm the occupancy and species accumulation curve, that would reflect on the adequacy of sampling. A longer study covering different microhabitats for better representation of the avifaunal richness of the area should have been carried out.

Globally threatened species such as Rusty-throated Wren-Babbler (also known as Mishmi Wren-Babbler) was rediscovered from the area in 2004 after almost 60 years. However, it does not find mention in the report. Rasmussen *et al.* (2017) reported this species from Anini area, which is 30 km north of Etalin. There is high probability of its occurrence in the Etalin area as the altitude is favourable to it. Black-headed Greenfinch and Elliot's Laughingthrush – new additions to the birds of India – were recorded from this region (Dalvi 2013), however, these species are not mentioned in the WII report.

A total of 16 species of birds in the area are listed as being species of conservation importance. The high species richness of birds, including many endemic and globally threatened species recorded during the short-term study, indicates the rich avifaunal diversity of the area. The report ignores the fact that construction and widening of roads leading to the project site would severely impact the habitat there (apart from the actual project site).

A mitigation plan was suggested for only 32 cavity-nesting bird species, but does not provide any mitigation plan for the resulting loss of habitat for the other 198 bird species. The mitigation plan recommends installation of artificial nest boxes for cavity-nesting birds in nearby forest patches to compensate for the habitat loss. However, proving artificial nests will not solve the problem, as different species have specific microhabitat preferences for feeding. Besides, the birds may not use the artificial nest boxes provided; there is no empirical evidence of use of artificial nests by forest birds in India. Artificial nests are usually provided to generalist birds found in urban areas or other human habitations. Installation of nest boxes will not compensate for the loss of habitat.

Macro-invertebrates: Benthic macro-invertebrates are considered one of the most important bio-indicator groups for freshwater ecosystems. These key taxa were identified only up to the family level, considering each family as a different taxon, which results in a significant under-representation of the actual diversity.

Invertebrate fauna: The report lists 159 species of butterflies, 11 species of odonates, and 51 species of moths, which is low and may not be a true representation of the study area's species richness of entomofauna. There are many threatened and endemic insect species even in the Etalin area that have not been reported. Further, many species mentioned in the report have been erroneously assigned to different taxonomic groups. Despite this, the discovery of 200+ species of entomofauna underscores the immense evolutionary and ecological wealth of this area. Specific comments are given below.

Butterflies: 381 species of butterflies have been reported from Dibang Valley in the last 10 years (Gogoi 2020, unpublished data), while up to 500 species are believed to exist in the region. However, the report mentions only 159 species from the project site, of which 12 species are not in fact distributed in Northeast India. The riparian habitat within the Etalin area is likely to have around 290–300 butterfly species, judging from a four-month survey in a similar habitat in Lower Dibang Valley that recorded 294 species (Gogoi 2012). The report appears to consider the importance of butterflies (and other insects) as limited to pollination services ("it is very important to conserve butterfly species, as they help in pollination", p. 172). The role of butterflies

Sixteen birds, Oriental Pied Hornbill (1), Ward's Trogon (2), Beautiful Nuthatch (3), Bengal Florican (4), Blyth's Tragopan (5), Rusty-throated Wren-Babbler (6) and Yellow-rumped Honeyguide (7), – to name a few – are found in the proposed project site area are species of high conservation importance

is not confined to being essential pollinators, but extends to the food web, where they are key prey species for predators. They also have a cultural significance to indigenous Idu Mishmi tribes and are vital for ecotourism in the region.

Moths: The report's account of 51 moth species is an extremely low representation. Around 10,000 species of moths occur in India, and the Etalin area is likely to have 600–700 species. Many species in this habitat type and elevation are yet to be discovered.

Odonata: The report states that 11 odonate species occur in Etalin area, which is a considerably low estimate. More than 60 species are expected to be found in the Etalin area with adequate sampling and correct identification (Arajush Payra 2020 pers. comm.). Only two species of damselfly are reported, which is a serious underestimate for Dibang Valley. Even common species observed at virtually all water bodies across Dibang Valley, such as *Ischnura rubilio*, *Ceriagrion coromandelianum*, *Calicnemia miles*, and *Pseudagrion rubriceps* have not been included, indicating inadequate sampling. A species new to India, *Echo perornata*, recently reported from Hunli-Anini road in Dibang Valley (Gogoi and Payra 2019), does not make it into the report as well.

Arachnids: Lesser-known invertebrate groups like spiders need focused studies. According to the report, 113 species of spiders were recorded, among which around 70 species and 4 genera were not fully identified. This could mean that these species are new to science or are lesser-known species. There is also a huge possibility that these species are endemic to the area. A thorough study and identification of these species is essential, for how can we devise a conservation plan if we don't even know what to conserve?

Herpetofauna: Rapid assessment survey for reptiles and amphibians was carried out by WII in winter. However, the peak activity periods of these two groups are during summer and monsoon. Therefore, the study has an inbuilt bias of representation of the taxa. The WII report lists the presence of 13 species of amphibians in the

Under-representation of reptiles found in the area is a major concern with surveys conducted in the proposed project area. In this collage: Abor Hill Agama (1), Green Fan-throated Lizard (2), and Bent-toed gecko (3)

The herpertofauna of Northeast is biodiverse. Zaw's Wolf Snake (1), Common Mock Viper (2), Pope's Pit Viper (3), Greater Black Krait (4), and Large-eyed False Cobra (5) are some snake species found in the area

ATHARVA SINGH

One of the fifty Rhododendron species in bloom in the Dibang Valley

RAFIKUL ISLAM

The Dibang River is one of the pristine rivers of India

study area. However, Roy *et al.* (2018) had reported 38 species of the amphibians from Dibang Valley. Eleven unidentified species of frogs were recorded, which suggests that these species are rare and / or potentially new to science. In addition, errors in scientific names, distribution records, and incorrect identification are other issues that require scientific scrutiny.

A recent survey in Kamlang district, which adjoins Dibang and West Kameng of Arunachal Pradesh, has led to discoveries of two new snakes, namely *Trachischium aptei* and *Trimeresurus salazar*. This shows that Arunachal Pradesh has great potential for new discoveries. Hitherto, Dibang Valley has not been explored to its full potential, and several species yet unknown to science are waiting to be discovered here.

Other concerns

- The Etalin hydroelectric project is in a seismically active zone (Zone V) – of the Himalaya. Four earthquakes have been reported in Tangon river basin [28 December 2008 - M 3.7, and 1 March 1983 M 5.0]; Dri river basin [8 May, 1993 - M 4.7, and 8 November 1997 M 4.7]. This makes the area vulnerable to natural disasters. Hence, the dam, if built, will not only threatens the life of people downstream, but also poses a threat to the larger landscape of the Brahmaputra floodplains.
- This entire region falls under the IUCN management categories III and IV, Endemic Bird Area, Global Biodiversity Hotspot, and Key Biodiversity Area, indicating its vital importance at the global level. In fact, this area has greater biodiversity than any other part of the country. Therefore, it is advisable to conduct multiple seasonal replicate studies for biodiversity assessment.
- The scale of the project will result in a huge amount of debris during excavation and construction. The report does not mention any plan for disposal of the debris created. If it is dumped in the area, the debris will have significant ecological impacts on the entire Dibang river basin.
- Heavy degradation of forest is inevitable once the project is functional. Pylons to carry the high-tension electric lines will pass through this ecologically sensitive area. To maintain these linear structures, tracts of vegetation will have to be cleared, causing more damage to the forest.
- The possible impact of vehicular traffic on wildlife remains unexplored. Construction on this scale would require huge logistic support, which will increase traffic in the area. All this traffic would go through Mehao Wildlife Sanctuary and Idu Mishmi Community Conserved Area. Road widening would be required at many places. This will lead to degradation and fragmentation of the area.
- In order to compensate for forest loss due to the project, the State Forest Department has proposed compensatory afforestation in Tawang block of Western Arunchal Pradesh. The afforestation area is about 420 km from the project site. It is not clear whether this afforestation will be carried out in degraded land or elsewhere. A valid question also arises on how this so called 'compensatory afforestation' will compensate the forest loss in Etalin.
- Finally, according to University of Colorado, National Snow and Ice Data Center and GLIMS (Global Land Ice Measurements from Space), Dibang has around 300 glaciers that are melting rapidly due to warming. Establishing a hydropower plant in close proximity to these glaciers will increase the risks of glacial flood outbursts, which would cause havoc and destruction in widespread regions of the Dibang Valley.

Conclusion

River Brahmaputra acts as a biogeographic barrier for several taxa such as birds, reptiles, and amphibians. This increases its potential for a rich endemic biodiversity. Eastern Arunachal Pradesh (Mishmi Hills) and especially the tributaries of Brahmaputra still remain understudied with regard to biodiversity. Large parts of Dibang Valley remain scientifically unexplored.

The studies conducted by R.S. Envirolink Technologies Pvt. Ltd and WII contain discrepancies such as biased sampling, usage of incorrect names for species, and doubtful checklists of flora and fauna. These studies are inadequate to draft a conservation strategy and conservation management plan for the project area.

It is crucial to conduct thorough scientific studies of the region, so that true representation of flora and fauna is reflected in reports. Lack of such information endangers the existence of the region's rare and threatened flora and fauna, some of which may not yet be known to science. A decision support system based on a scientific foundation would give justice to the development plans of the area resulting from the proposed project. Any decision in the absence of such a system may cause harm to the ecosystem, species living in the area, as well as the well-being of the people who belong there. ■

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Harshal Bhosale is currently a Scientist at the BNHS. He has described a new snake species from Arunachal Pradesh.

Mandar Sawant is a Naturalist Explorer with the BNHS. He is interested in travel for it has to be wildlife photography.

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Report on State of India's Birds (2020)

A report titled STATE OF INDIA'S BIRDS was released on February 17, 2020, at the 13th Conference of Parties of the Convention on the Conservation of Migratory Species of Wild Animals (COP 13) at Gandhinagar, Gujarat. The report was released by Shri C.K. Mishra, IAS, Secretary, Ministry of Environment, Forest and Climate Change. The first-of-its-kind for India, this analysis was carried out by 10 governmental and non-governmental research and conservation organizations: Ashoka Trust for Research in Ecology and the Environment (ATREE), Bombay Natural History Society (BNHS), Foundation for Ecological Security (FES), National Biodiversity Authority (NBA), National Centre for Biological Sciences (NCBS-TIFR), Nature Conservation Foundation (NCF), Sálim Ali Centre for Ornithology and Natural History (SACON), Wetlands International-South Asia (WI-SA), Wildlife Institute of India (WII), and World Wide Fund for Nature-India (WWF-India).

Common and widespread species are declining the world over, but in India, conservation attention has been focused on only a few species (usually large, charismatic and threatened) due to lack of information. This report is the outcome of the first comprehensive assessment of the distribution range, trends in abundance, and conservation status for most of the Indian bird species, and is a significant step forward in the monitoring and conservation of India's rich and varied biodiversity, as it assesses the status of 867 Indian birds using information contributed by over 15,500 birdwatchers to the online platform eBird. You can read and download the report at https://www.stateofindiasbirds.in/ ■

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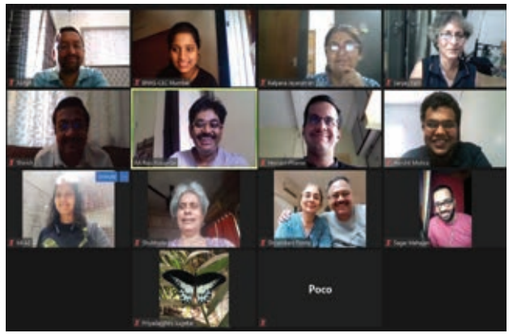
(L-R) Shri Dhananjai Mohan, Shri C.K. Mishra and Shri Sanjay Kumar releasing the report

Lockdown Lessons



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Screen shot of the butterfly course wrap-up session

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Dr Raju Kasambe conducting a webinar

Since the lockdown began in March, the BNHS Conservation Education Centre (CEC) in Mumbai has remained closed for all public activities. But the Centre has been hosting free webinars by experts on environment and wildlife. The webinar series started on April 4, 2020, with a talk on 'Basic Bird Identification and Birdwatching' by Dr Raju Kasambe (Assistant Director – Education). Since then, more than 25 webinars have been conducted, and the response of people across India and abroad has been phenomenal. More than 7,260 enthusiastic citizens, amateurs, and students interacted with the experts. If you missed these webinars, you can watch them on BNHS's YouTube channel. Innumerable people have viewed the videos on the channel so far. ■

Winter Bird Walk at Surajpur Wetland

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Students of Step by Step School watching birds with a spotting scope

About 150 students of Step by Step School attended a Winter Bird Walk at Surajpur wetland, Uttar Pradesh, conducted by the BNHS Conservation Education Centre, Delhi in collaboration with Ninox – Owl about Nature, in February 2020. The walk started with a basic introduction to birds and their importance in the ecosystem.

Our resource persons elucidated on the birds found in different habitats in the area, such as wetland and forest. Bird species like Grey Heron, Cattle Egret, Spot-billed Duck, and Yellow-wattled Lapwing were seen during the walk. The students were amazed to see the migratory birds that had arrived at Surajpur. They observed the birds with the spotting scopes provided by BNHS. ■

Understanding Climate Change and Spreading Awareness

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Participants of the activities conducted on February 21, 2020, at Labrang Monastery, Phudong

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Students of Classes IX-X and teachers of Jawahar Navodaya Vidyalaya, Phudong attended the lecture on March 03, 2020

BNHS PHOTO LIBRARY

Students of Classes VI-VIII along with four teachers and Principal of Namok Junior High School attended the talk

A BNHS study on the impacts of Climate Change on specific indicator species like pheasants and finches across the Himalaya is in progress since 2016. This project titled "Status, Distribution and Conservation of Pheasants (Phasianidae) and Finches (Fringillidae) in Eastern Himalaya (Sikkim)" is a long-term research programme funded and supported by Oracle, and facilitated by CAF-India.

While carrying out studies on the target species in Sikkim, the BNHS team is also focusing on developing different resource groups from different sectors – educational institutes, monasteries, State Forest Department, and panchayats, among others. This is done to facilitate public participation and activities, ensuring sustainable development and continuous monitoring and conservation of forest biodiversity at large. One of the primary objectives of these activities is raising awareness among the communities about the rich biodiversity of the Sikkim Himalaya and highlighting the challenges faced by pheasants and finches (and other birds) as a result of climate change. Dr Himadri Sekhar Mondal (Scientist A, BNHS) and Mr Atharva Singh (PhD Scholar, BNHS) gave talks on Climate Change and its impacts on wildlife and biodiversity. ■

BNHS-ENVIS Activities

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A beach clean-up and marine education workshop was conducted on February 21, 2020, along with the Oracle team, Children's Scrappy News Service, and Rishi Valmiki Eco School, Goregaon

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To mark International Day of Forests 2020, a photography competition was organized on March 21, 2020. Around 88 participants joined the programme

ENVIS Resource Partner on Avian Ecology (BNHS-ENVIS) contributes in myriad ways to disseminate information on avian ecology. Beach clean up and celebrating International Day of Forests, Earth Day, World Wildlife Day with citizens were a few of the activities conducted by the ENVIS team. ■

A special moment for BNHS

Hornbill House had a rare and distinguished visitor in January 2020. Ms Gwendy Butler, the daughter of Stanley Henry Prater, one of the most cherished stalwarts of the Bombay Natural History Society, came down from England with her family to reconnect with her father's past and relive her memories of Bombay. BNHS Director Dr Deepak Apte and the Collections team took her through the natural history specimens at Hornbill House, gathered over a 100 years ago when her father was the Curator.

To recall in brief, S.H. Prater was associated with the BNHS from 1907 to 1948. He was appointed Curator of the Society in 1923. At that time, the Natural History section of Prince of Wales Museum (now Chhatrapati Shivaji Maharaj Vastu Sangrahalaya) was still under the management of the Society. Prater brought in significant changes to the way natural history collections are exhibited in the museum. THE BOOK OF INDIAN ANIMALS by Prater, published in 1948, remains a landmark publication till date. Prater was deeply committed to the protection of wildlife in India. When he emigrated to Great Britain in 1948, he left the BNHS well set to take on the challenges of a post Independence future. ■

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BNHS stalwart S.H. Prater's daughter Ms Gwendy Butler holds a specimen as she listens keenly to BNHS Director Dr Deepak Apte

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